

Chickenpox and Shingles

(Chickenpox is also known as Varicella;
Shingles is also known as Herpes Zoster)



Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

Chickenpox, also known as varicella, and shingles, also known as herpes zoster, are caused by the varicella zoster virus (VZV), a DNA virus belonging to the herpes virus group. Primary infection with VZV causes chickenpox. Like other herpes viruses, VZV has the capacity to persist in the body as a latent infection after the primary infection has occurred. Shingles results from reactivation of latent infection.

B. Clinical Description

Chickenpox

Chickenpox is characterized by a pruritic (itchy) rash that evolves from spots (macules) to bumps (papules) to blisters (vesicles), and eventually into dried crusts over 5–6 days. All three types of lesions (macules, papules, and vesicles) are present at the same time, and they tend to be more abundant on covered parts of the body. They can also occur on mucosal surfaces such as the mouth and the throat. In adults, and less commonly in children, fever and constitutional symptoms may precede the rash by 1–2 days. Mild, atypical, and inapparent infections can occur, but are unusual in unvaccinated individuals. The disease is usually milder among children and can be more severe in adolescents and adults. Immunity following chickenpox infection is considered to be long-lasting, but rarely, second cases of chickenpox do occur among immunologically normal individuals.

Chickenpox vaccine has been available since 1995 and has been shown to be 70–86% effective at preventing chickenpox in general and 95% effective at preventing severe disease. In some settings, effectiveness has been as low as 40–59%, but this lowered efficiency may have been caused by improper vaccine storage and handling.

Complications of chickenpox include pneumonia (viral and bacterial), secondary bacterial infections, low platelet counts (thrombocytopenia) and bleeding, arthritis, hepatitis, encephalitis or meningitis, neurological dysfunction, kidney impairment, and death (1/100,000 children aged 5–9 with chickenpox; 1/5,000 adults with chickenpox). Invasive group A streptococcal disease (GAS) has been increasingly reported as a complication of chickenpox and can result in relatively minor skin infection (cellulitis) or in necrotizing fasciitis (“flesh-eating bacteria”), overwhelming infection, and toxic shock syndrome (TSS). While pneumonia is unusual in healthy children, it is the most common complication in adolescents and adults.

Pregnant women, immuno-compromised persons, children less than one year old, older adolescents, adults, patients with chronic skin or pulmonary disorders, and patients receiving steroids or chronic aspirin therapy are more likely to experience serious complications with chickenpox. The risk is especially high when steroids, such as prednisone and cortisone, are given during the incubation period for chickenpox. However, healthy children may rarely develop serious complications and may even die from chickenpox.

Infants born to women who developed chickenpox within a period of five days before delivery to two days after delivery are at high risk of severe chickenpox, which can be fatal. Congenital varicella syndrome, characterized by developmental abnormalities, encephalitis, mental retardation, and low birth weight, may occur among 0.4–2.0% of infants born to women infected with chickenpox during the first two trimesters of pregnancy.

Vaccine-Modified Varicella Syndrome (VMVS or 'Breakthrough Chickenpox')

Breakthrough chickenpox is a form of chickenpox that occurs in a vaccinated individual and is less severe due to the development of “partial immunity” sufficient to decrease symptoms but insufficient to prevent disease. VMVS occurs more than 42 days after vaccination. It can occur in up to 20% of vaccinated children and 27% of vaccinated adults. If the incidence of “breakthrough” disease is greater than 30% in any setting, the Massachusetts Department of Public Health (MDPH) should be notified for further investigation of the cases, and a vaccine ‘cold chain’ evaluation should be performed. VMVS usually presents as a generalized rash consisting of <50 lesions, with only a few vesicles. Patients are often afebrile and minimally symptomatic. Individuals with VMVS are still considered infectious, but to a lesser degree than those with non-VMVS disease. Crusting over may occur more quickly than the usual 5 days after rash onset (e.g., 2–3 days after onset), allowing earlier return to childcare/school.

Shingles

Following primary infection, VZV remains in human nerve tissues and is reactivated in approximately 15% of infected persons, resulting in shingles (herpes zoster). Shingles presents as a red, painful, itchy, and blistering rash, typically in one area on one side of the body, in the distribution of a nerve. There are usually no fever or other systemic symptoms. Pain and itching in the area of the shingles may persist after the lesions have resolved (post-herpetic neuralgia). Shingles can be treated with several antiviral agents. It can occasionally become serious in immuno-compromised persons, with generalized skin eruptions and central nervous system, pulmonary, hepatic, and pancreatic involvement.

Shingles following vaccination has been reported, although the risk of developing shingles from non-vaccine type virus is 4–5 times greater than the risk from vaccine virus.

C. Vectors and Reservoirs

Humans are the only known host of VZV.

D. Modes of Transmission

VZV is transmitted from person to person by the following means:

From chickenpox cases:

- ◆ Droplet spread when a person coughs or sneezes;
- ◆ Direct contact with upper respiratory secretions or lesions that have not yet crusted over; or
- ◆ Airborne spread.*

**Note: While chickenpox can be airborne, this is very rare in school settings. It would primarily occur when the individual with chickenpox is immuno-compromised, which would be unusual in the school environment. Potential airborne spread should not routinely be used as a parameter to determine exposure. See Section 4B for guidance on how to identify those exposed to chickenpox.*

From shingles cases:

- ◆ Direct contact with lesions.

From disseminated shingles cases or localized shingles cases in the immuno-compromised:

- ◆ Direct contact with lesions; or
- ◆ Airborne spread.

Chickenpox is highly infectious, with secondary infection rates in susceptible household contacts ranging from 65–86%. Exposure to chickenpox does not cause shingles. Exposure to shingles can result in chickenpox in a susceptible person, but it cannot cause shingles.

E. Incubation Period

The incubation period for chickenpox is usually 14–16 days, with a range of 10–21 days. This period may be prolonged for as long as 28 days by use of varicella zoster immune globulin (VZIG) or intravenous immune globulin (IGIV), and it may be shortened in immuno-compromised patients. Shingles has no incubation period; it is caused by reactivation of latent infection from primary chickenpox disease.

F. Period of Communicability or Infectious Period

The infectious period for chickenpox is from 1–2 days before the rash appears (but may be earlier in immuno-compromised individuals) until all of the vesicles have formed scabs, which usually occurs within 5 days of rash onset. Contagiousness may be prolonged in immuno-compromised patients. The infectious period for shingles lasts until all lesions have crusted over.

Vaccinated persons with chickenpox may develop lesions that do not crust (macules and papules only). These persons are no longer contagious once the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later.

G. Epidemiology

Chickenpox occurs worldwide, although incidence is lower in the tropics than in the temperate zones. In the U.S., incidence is highest between March and May and lowest between September and November. Most cases of chickenpox in the U.S. occur in children younger than ten years of age.

Changes in the epidemiology of chickenpox have been observed as an increasing proportion of children in the U.S. become protected by vaccination. In 2003, national vaccine coverage was 85% in children 19–35 months old. National surveillance at 3 sites (1.2 million people) demonstrated a 70–80% decrease in disease incidence and in hospitalization since the introduction of vaccine in 1995. Over the last few years, the number of cases of chickenpox in Massachusetts has declined by close to 70% (MA Behavioral Risk Factor Surveillance Survey [BRFSS]), as vaccination rates for children 19–35 months reached 89% in 2003 (National Immunization Survey [NIS]).

As vaccine coverage increases and the incidence of wild-type chickenpox decreases, a higher proportion of chickenpox cases will occur in immunized people as breakthrough disease. In 2004, approximately 70% of reported cases in Massachusetts occurred in vaccinated individuals.

Shingles is found worldwide and has no seasonal variation. This disease increases with increasing age and is more common among immuno-compromised persons and among children with a history of intrauterine chickenpox or chickenpox occurring within the first year of life. The latter have an increased risk of developing shingles at an early age. Approximately 15% of the general population will experience shingles during their lifetime.

H. Bioterrorist Potential

VZV is not considered to be of risk for use in bioterrorism.



Section 2:

REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any of the following:

- ◆ Individual cases of clinically diagnosed or laboratory-confirmed chickenpox;
- ◆ Unusual case(s)/clusters, as outlined in Section 3B; or
- ◆ Deaths where chickenpox was a contributing cause.

Note: See Sections 3B and 3C for information on how to report a case.

B. Laboratory Testing Services Available

Chickenpox

Laboratory diagnosis of chickenpox is not routinely required but may be useful in special circumstances such as:

- ◆ Cases of atypical clinical presentation, mild or severe.
- ◆ Cases of severe disease.
- ◆ Post-vaccination events, such as:
 - Rash with >50 lesions 7–42 days post-vaccination;
 - Suspected secondary transmission of the vaccine virus;
 - Shingles; and
 - Any serious adverse event (e.g., pneumonia, encephalitis, cerebral ataxia).
- ◆ Clusters of breakthrough chickenpox in vaccinated individuals.
- ◆ Chickenpox reinfection in unvaccinated individuals.

Diagnostic tests for recent chickenpox infection include the following:

Test	Specimen	Comments
Polymerase Chain Reaction (PCR)	Body fluid or tissue	Distinguishes wild type strains from vaccine virus. Very sensitive.
Tissue Culture	Vesicular fluid	Distinguishes VZV from other viruses causing febrile, vesicular rash illness. Costly, limited availability.
Direct Fluorescent Antibody (DFA)	Vesicle scraping	Distinguishes VZV from other viruses causing febrile, vesicular rash illness. More rapid and sensitive than culture.
Enzyme Immunoassay (EIA) for IgG	Acute and convalescent serum specimens	Requires special equipment. May not be sensitive enough to identify vaccine-induced immunity.
Latex Agglutination (LA) for IgG	Acute and convalescent serum specimens	Rapid (15 minutes), special equipment not needed. More sensitive but less specific than EIA.
Indirect Fluorescent Antibody (IFA) for IgG	Acute and convalescent serum specimens	Requires special equipment. Good sensitivity and specificity.
Fluorescent Antibody to Membrane Assay (FAMA) for IgG	Acute and convalescent serum specimens	Very sensitive and specific, but not widely available.
Complement Fixation (CF)	Acute and convalescent serum specimens for IgG	Poor sensitivity.
Tzanck smear	Vesicle scraping	Reveals multinucleated giant cells with inclusion under microscopy. Not specific for VZV. Less sensitive and accurate than DFA.
Capture Enzyme-Linked Immunosorbent Assay (ELISA) for IgM	Single sera capture	Confirms diagnosis of acute chickenpox infection; does not distinguish between vaccine virus and wild-type VZV. Commercially available tests lack sensitivity and specificity. The only reliable IgM testing is available under special circumstances at the Centers for Disease Control and Prevention (CDC). See note below.

Abbreviations: IgG (immunoglobulin G); IgM (immunoglobulin M).

Adapted and updated from: American Academy of Pediatrics. [Varicella-Zoster Infections.] In: Pickering L.K., ed. *Red Book: 2003 Report of the Committee on Infectious Diseases, 26th Edition*. Elk Grove Village, IL, American Academy of Pediatrics; 2003: 675.

Note: Testing for varicella IgM antibody is available at the CDC under special circumstances. A single positive serologic test for varicella-zoster IgM antibody is evidence for recent exposure to VZV. The preferred method for testing for IgM antibody is the capture ELISA, which eliminates interference from VZV-specific IgG that might be present. Testing using commercial serologic test kits is not recommended since available methods lack sensitivity and specificity. A positive result for IgM antibodies confirms the diagnosis of acute chickenpox infection; it does not distinguish between vaccine virus and wild-type VZV infection. A negative result for IgM antibodies does not necessarily rule out chickenpox when the clinical features suggest chickenpox because VZV appears to stimulate transient IgM production that is inconsistently observed.

The MDPH State Laboratory Institute (SLI) provides testing services for chickenpox, but only under special circumstances and with prior approval from a MDPH Immunization Program epidemiologist, at (617) 983-6800 or (888) 658-2850. Among chickenpox testing services offered at the SLI, the PCR assay and a rapid viral culture technique are the most useful in terms of timeliness and sensitivity. The SLI also performs conventional viral culture, rapid identification by DFA, and LA for IgG on acute and convalescent paired sera.

Serologic Testing in Those with Uncertain Histories of Chickenpox

Immunity testing of exposed contacts is not routinely recommended, although it may be recommended in certain circumstances (e.g., for pregnant women and other high-risk contacts, and in health care settings or outbreaks).

Serologic tests for immunity include EIA, LA, IFA, FAMA, radio immunoassay (RIA), and CF. These antibody tests are reliable for determining immune status in healthy hosts after natural infection, but may not be reliable in immunocompromised people. LA can be done quickly and may be a useful post-exposure test; however, recent evidence has shown that false positives can occur, incorrectly categorizing a susceptible person as immune. Therefore, less sensitive EIAs are recommended for screening purposes when possible. In special circumstances, with approval from a MDPH immunization epidemiologist, the SLI may be able to perform immunity testing or to arrange for immunity testing to be performed at the CDC in adolescents and adults with a negative or uncertain history of chickenpox.

Serologic Testing after Vaccination

Because seroconversion rates are so high in individuals receiving varicella vaccine (97% in children <13 years receiving 1 dose; 99% in adolescents [≥ 13 years] and adults receiving 2 doses), routine testing after vaccination is not recommended. However, in certain circumstances, it may be indicated.

Serological testing is available at many commercial laboratories. Both FAMA and LA can be used to detect an immune response following vaccination. FAMA is preferred because it is very sensitive and specific, but it is not widely available. If the less sensitive EIA is used for initial screening post-vaccination, then further tests should be conducted on individuals with negative results using a more sensitive test (e.g., FAMA or LA). Post-vaccination serologic testing is not available at the SLI.

Shingles

Laboratory confirmation is not usually indicated; however, it may be useful in the diagnosis of unusual or severe cases. Diagnostic tests for shingles include DFA, viral culture, PCR, and Tzanck smear. Serologic testing is not helpful for the diagnosis of shingles.

Immunity testing of exposed contacts is not routinely recommended, although it may be recommended in certain circumstances (e.g., for pregnant women and other high-risk contacts, and in health care settings). See *Serologic Testing in Those with Uncertain Histories of Chickenpox* section above for further information regarding serological testing of shingles contacts.



Section 3:

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting of Chickenpox

- ◆ To monitor the impact of vaccination on age-specific incidence and on severity of chickenpox.
- ◆ To evaluate vaccine efficacy under conditions of routine use and to track instances of vaccine failure.
- ◆ To identify groups and areas in which risk of disease is highest so prevention and control efforts can be focused.
- ◆ To track and minimize the occurrence of complications, such as invasive GAS infection.

B. Laboratory and Health Care Provider Reporting Requirements

Chickenpox is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of chickenpox, as defined by the reporting criteria in Section 2A.

Health care providers and school health personnel should report cases of chickenpox to their LBOH on at least a monthly basis, using a MDPH *Chickenpox (Varicella) Case Report Form* (found at the end of this chapter) for each case. Some LBOH may prefer more frequent reporting and can work with the providers and schools in their towns for more timely reporting. In addition, health care providers should also report any unusual or high-risk cases, outbreaks, or cases in high-risk settings immediately by telephone to the LBOH and to the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850, so that epidemiologists can assist with control measures. Examples of such cases include: 1) case(s) with unusual presentation or severe complications (including invasive GAS infection, pneumonia, hospitalization, death); 2) case(s) in immuno-compromised individuals; 3) outbreaks involving adolescents and adults; 4) outbreaks within vaccinated populations (these may point to improper storage and handling of vaccine); 5) case(s) in health care settings; 6) case(s) in childcare centers with infants; 7) case(s) in other high-risk institutional settings; and 8) large outbreaks.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of varicella infection (not just immunity) shall report such evidence of infection directly to the MDPH within 24 hours.

Deaths for which chickenpox was a contributing cause must also be reported.

Shingles cases do not need to be reported to the LBOH or to the MDPH.

C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities

Reporting requirements

MDPH regulations (*105 CMR 300.000*) stipulate that chickenpox is reportable to the LBOH and that each LBOH must report any case of chickenpox or suspect case of chickenpox, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) using an official *MDPH Chickenpox (Varicella) Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked “Confidential”) to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)
305 South Street, 5th Floor
Jamaica Plain, MA 02130
Fax: (617) 983-6813

Please report all cases of chickenpox, whether reported to you by providers, school nurses, or other health professionals. If you receive multiple reports for the same case, please combine the information on a single case report form. The reports can be batched and mailed or faxed to the MDPH on a monthly basis.

Note: LBOH are responsible for residents of their city/town, but cases are reported to the city/town where the diagnosis is made. Reports of illness received for residents of other cities/towns should be forwarded to the LBOH of that city/town.

Any unusual or high-risk case(s), outbreaks, or cases in high-risk settings should be reported immediately to the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2850, so that epidemiologists can assist with control measures. Examples of such cases are listed in Section 3B.

Please note that deaths for which chickenpox was a contributing cause must be reported; the MDPH will complete the investigation of such deaths.

Case Investigation

In order to assess the likelihood of a case or suspect case of chickenpox, the MDPH and/or other public health staff involved in the investigation should ask about:

- ◆ Clinical presentation;
- ◆ Varicella immunization;
- ◆ Country of origin and length of residence in the U.S. (those in the U.S. for a short period of time are more likely to be susceptible);
- ◆ Recent history of travel (to where and dates);
- ◆ Whether there were any recent out-of-town visitors (from where and dates);
- ◆ Whether there was any recent contact with anyone with similar symptoms;
- ◆ Risk factors for disease (e.g., age <12 months, pregnant, immunosuppressed);
- ◆ Exposure and transmission settings (e.g., health care, childcare, school, institutional/residential settings [e.g., correctional facility, shelter, group home, military, and college]).

- ◆ Antiviral treatment is recommended for some individuals including, but not limited to, immuno-compromised individuals, those with certain chronic medical conditions, pregnant women, healthy adolescents and adults, and secondary case patients who are household contacts of infected children. Please refer to the latest version of the American Academy of Pediatrics *Red Book 2003: Report of the Committee on Infectious Diseases*, for further guidance (see *References* section for full citation).

Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Sections 4 and 5.



Section 4:

CONTROLLING FURTHER SPREAD: CHICKENPOX

Note: For specific guidelines on controlling chickenpox that is spread from shingles, see Section 5.

A. Isolation and Quarantine Requirements (105 CMR 300.200)

Minimum Period of Isolation of Patient

If vesicles are present, until lesions have dried and crusted or until no new lesions appear, usually by the fifth day (counting the day of rash onset as day zero). If no vesicles are present, until the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later.

Minimum Period of Quarantine of Contacts

Susceptible students or staff in non-health care settings who are not appropriately immunized or are without laboratory evidence of immunity or a reliable history of chickenpox, shall be excluded from school from the 10th through the 21st days after their exposure to the case while the case was infectious with rash (not including the prodrome). If the exposure was continuous, susceptibles shall be excluded from days 10–21 after the case's rash onset. In high-risk settings, the MDPH may impose more rigorous exclusion criteria. Neonates born to mothers with active chickenpox shall be isolated from susceptibles until 21 days of age. Health care workers who are not appropriately immunized, are without laboratory evidence of immunity, or do not have a reliable history of chickenpox, shall be excluded from work (or isolated) from the 10th day after their first exposure during the case's infectious period (including the prodrome) through the 21st day after the last exposure during case's infectious period. Anyone receiving VZIG or IGIV shall extend their exclusion to 28 days post-exposure.

B. Protection of Contacts of a Case of Chickenpox

1. Determine the type of chickenpox rash illness as either: 1) wild-type, 2) breakthrough, or 3) vaccine side-effect. Use *Attachment A: Guidelines for Evaluating Chickenpox-like Rash in Recipients of Varicella Vaccine in Childcare and School Settings* (found at the end of this chapter) as a guide. Cases of wild-type chickenpox and breakthrough chickenpox disease are treated equally with regard to infectiousness and control measures, as outlined below.

Vaccine side-effects, however, are considered differently. Mild rashes following varicella vaccination occur in 4% of recipients of varicella vaccine. These rashes typically occur 1–3 weeks after vaccination, and cases of vaccine-

associated rash are thought to be only rarely infectious. For this reason, control measures are generally not necessary and neither is exclusion, provided no high-risk susceptible contacts are identified.

2. The rigor of control measures for chickenpox depends on the setting. While the general chickenpox control measures outlined below are appropriate for most settings, more stringent control measures are needed in certain settings where the risk of transmission, as well as the likelihood of severe disease, is increased. Factors to consider when determining the risk environment include:
 - a. Residential/institutional setting (examples of high-risk residential settings include, but are not limited to, correctional facilities, group homes, military settings, dormitories, or work places with a large number of non-U.S. born individuals);
 - b. Health care setting;
 - c. Number of susceptible individuals who are at high risk for complications of chickenpox (immuno-compromised, pregnant women, newborns);
 - d. Number of individuals who were not born in the U.S.; and
 - e. Number of individuals who may not be able to provide reliable histories of past disease.

After determining risk factors, control measures may need to be more rigorous (e.g., measures regarding acceptance of past history of disease as proof of immunity, acceptable time period for post-exposure vaccination, acceptability of post-exposure vaccination at all).

Control measures for health care settings are addressed in Section 4C.

3. Isolate the case on precautions if vesicles are present, until all lesions have crusted over, usually by the 5th day after rash onset, but sometimes longer in immuno-compromised patients. If no vesicles are present, isolate the patient until the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later.

Notes on treatment of the case:

- a. Aspirin: Children (≤ 18 years of age) with chickenpox should not receive aspirin or other salicylates because they are associated with an increased risk of Reye syndrome.
- b. Antivirals: Chickenpox and shingles may be treated with antiviral agents such as acyclovir, famciclovir, and valacyclovir. The decision to use therapy and the duration and route of therapy should be determined by the specific host factors, the extent of infection, and the initial response to therapy.

Note: Oral acyclovir is not recommended for routine use in otherwise healthy children with chickenpox.

4. Identify all those exposed. In general, exposure to chickenpox is defined as contact with nasopharyngeal secretions or lesions, face-to-face interaction, or sharing indoor airspace (usually within 3 feet) with an infectious person (e.g., occupying the same classroom, the same 2–4-bed ward, or adjacent beds in a large ward). Think in terms of “zones of exposure.” Zones of exposure depend on the: 1) mode of transmission; 2) immune status of the infectious case (immunosuppressed individuals are more infectious); and 3) immune status of those exposed (immunosuppressed individuals are at higher risk for complications). Keeping these criteria in mind, consider members of the following groups who may have been in contact with the case during his/her infectious period:

- a. Household members;
- b. School/childcare students and staff (consider interaction patterns, staffing patterns, and possibilities of shared airspace, face-to-face contact, and saliva exchange). See *School Setting* section below for more information on exposure in the school setting;
- c. Staff and patients of health care facilities (see Section 4C for more information);
- d. Work place contacts (especially in childcare, school, and health care settings—see Section 4C for more information);
- e. Social and religious groups;
- f. Sports teams and extracurricular activity groups;
- g. Bus/carpool mates;
- h. Close friends; and
- i. Persons potentially exposed at social events or while traveling.

School Setting

Identifying “zones of exposure” is a critical step in developing specific control interventions for chickenpox. When dealing with school settings, follow the parameters about determining zones of exposure, as described previously. The following are examples of exposure in a school setting:

- ◆ Sharing the same classroom;
- ◆ Sitting at the same table in a lunchroom;
- ◆ Sitting within several seats of the case in an auditorium;
- ◆ Riding the same bus/carpooling; or
- ◆ Participating on the same sports team or extracurricular activity.

In most settings, casual, brief contact would not constitute exposure for a contact or for an entire school. However, if the individual with chickenpox is immuno-compromised or if any contacts are immuno-compromised, wider “zones of exposure” may be considered, after consultation with the MDPH.

5. Identify susceptibles among the exposed. Susceptibles are those without proof of immunity, as defined below.

Proof of Immunity to Varicella ¹
<ul style="list-style-type: none"> ◆ Documentation of age-appropriate, prior vaccination against chickenpox (1 dose at 1–12 years of age or 2 doses, ≥ 1 month apart, at ≥ 13 years of age); ◆ Born in the U.S. before 1966 (regardless of history of chickenpox); ◆ Born outside the U.S. before 1966 with a reliable history of chickenpox (a recollection or record of past disease from the person, parent, or physician is sufficient^{2,3}); ◆ Born in or after 1966 (regardless of country of birth) with a reliable history of chickenpox (as described above); ◆ A reliable history of shingles based on health care provider diagnosis; or ◆ Serologic proof of immunity⁴.

- 1 Bone marrow transplant recipients should be considered susceptible, regardless of history of past disease.
- 2 A self-report of typical disease is sufficient for college students as well as for staff in all settings. The exception is in school settings, where a physician-certified history of disease is required for students in childcare, preschool, or grades K–12.
- 3 For those with a history of a mild atypical case, seek an epidemiological link to a typical chickenpox case (e.g., case is/was in the context of an outbreak or there was a case in the household or classroom within three weeks of illness) or laboratory confirmation of prior infection at time of acute illness. If such documentation is lacking, persons should not be considered as having a valid history of disease because other diseases may mimic mild atypical chickenpox.
- 4 Or, laboratory-confirmed at time of acute illness.

Guidance for Interpreting a Past History of Chickenpox

- ◆ In the pre-vaccine era (before 1995), the rash of chickenpox was distinct and subclinical cases were rare.
- ◆ Since chickenpox has been endemic in the U.S., epidemiologic and serologic studies indicate that >95% of U.S. born adults are immune to chickenpox, and adults with a negative or uncertain history are actually 71–93% likely to have VZV antibodies when tested. Those individuals born in the U.S. before 1966 are considered immune.
- ◆ In foreign-born adult populations, particularly those from tropical countries, the proportion immune to chickenpox is likely to be much lower as chickenpox may be less common in these countries. Therefore, those born outside the U.S. before 1966 should be considered immune only if they have a reliable history of disease.
- ◆ History of disease is likely to vary in different populations, and every effort should be made to obtain accurate histories of disease. These efforts should include the use of interpreters, as available, and verification of history with family members.
- ◆ For those individuals reporting atypical or mild cases of chickenpox, it is important to help establish the likelihood of disease by asking if household members or other close contacts (e.g., contacts in childcare, school, or other outbreak settings) had chickenpox within three weeks of the individual's illness (or if there was laboratory confirmation at time of acute illness). If such documentation is lacking, persons should not be considered as having a valid history of disease because other diseases may mimic mild atypical chickenpox.
- ◆ As we move forward in the post-vaccine era in the U.S., chickenpox will become less common and its clinical presentation less distinctive. For persons born in or after 1998, a history of chickenpox will become less reliable. If there is any question about the 'reliability' of the past history of chickenpox, the individual should be considered susceptible, unless serologic proof of immunity is obtained.
- ◆ Serologic testing for immunity is an option for individuals with a negative or uncertain history.

Note: For information on screening for immunity, see Section 2B.

6. Identify high-risk individuals among the susceptibles.

Varicella Zoster Immune Globulin (VZIG) is used in the care of certain exposed, susceptible individuals. Beginning in 2006, a licensed VZIG product will no longer be available in the U.S. However, an investigational VZIG product, VariZIG™, is available under an investigational new drug (IND) application with an expanded access protocol. VariZIG™ is now the preferred prophylactic of choice and should be given within 96 hours of exposure. However, when VariZIG™ is not available, administration of immune globulin intravenous (IGIV) should be considered as an alternative. IGIV should be administered within 96 hours of exposure. Although licensed preparations of IGIV are known to contain anti-varicella antibody titers, the titer of any specific lot of IGIV that might be available is uncertain because it is not routinely tested for anti-varicella antibodies.

Pharmacists and health care providers who expect to have patients who will need VariZIG™ may participate in a program that allows them to acquire inventory in advance. VariZIG™ delivered for inventory will be accompanied by all forms required by the IND expanded access protocol (i.e., release form, protocol, informed consent form, case report forms, investigator brochure, and the drug accountability form). Alternatively, if VariZIG™ is not available on site, a product release form can be requested directly from the company. FFF Enterprises should be contacted for more information to obtain this product (24-hour telephone, [800] 843-7477). Additionally, please check the CDC website for the most up-to-date information regarding the status and access to the IND product.

Please see the *Guidelines on VZIG or IGIV Prophylaxis* section below for information about dosage and administration of these products.

Immuno-compromised individuals should be referred to their health care providers. These individuals have a higher risk of serious complications with chickenpox infection, including disseminated disease resulting in multiple organ system involvement. Complications include pneumonia and encephalitis. Susceptible immuno-compromised persons (including HIV-infected persons) should receive VZIG (or IGIV, if VZIG is not available) as soon as possible, within 96 hours of exposure. For susceptible immuno-compromised individuals who cannot receive VZIG (or IGIV) within 96 hours, closely monitor for signs and symptoms of varicella and institute treatment with acyclovir if illness occurs. Specific guidelines are outlined below under *Indications*.

Pregnant women should be referred to their obstetricians. Susceptible pregnant women who contract varicella may be at higher risk for serious complications than adults in general, and their fetuses are at risk for congenital varicella syndrome. Hence, VZIG is indicated for susceptible pregnant women as soon as possible, within 96 hours of exposure. For pregnant women who cannot receive VZIG within 96 hours of exposure, clinicians may choose either to administer IGIV or to closely monitor the women for signs and symptoms of varicella and institute treatment with acyclovir if illness occurs. Whether the fetus is protected by VZIG or IGIV is unknown. Specific guidelines are outlined below under *Indications*.

Certain newborns (see below for criteria) are also at increased risk of complications and should receive VZIG (IGIV if VZIG is not available). For newborns who cannot receive VZIG (or IGIV) within 96 hours, closely monitor for signs and symptoms of varicella and institute treatment with acyclovir if illness occurs.

When deciding whether or not VZIG or IGIV is indicated, three factors should be considered carefully:

- ◆ **The likelihood the exposed person is susceptible to varicella;**
- ◆ **The probability that a given exposure to varicella or zoster will result in infection; and**
- ◆ **The likelihood that complications will develop if the person is infected.**

Indications for the use of VZIG (125U/10 kg), or IGIV (400 mg/kg) if VZIG is not available, are as follows*:

- a. Susceptible immuno-compromised patients (those without a reliable history of varicella, varicella immunization, or serologic proof of immunity).
- b. Neonates whose mothers develop signs and symptoms of varicella around the time of delivery (five days before to two days after).
- c. Premature infants who are ≥ 28 weeks gestation, were exposed during the neonatal period, and whose mothers do not have evidence of immunity.

- d. Premature infants who are <28 weeks of gestation or who weigh $\leq 1,000$ g at birth, and who were exposed during the neonatal period, regardless of maternal history of varicella vaccine or disease.
- e. Susceptible pregnant women (those without a reliable history of varicella, varicella immunization, or serologic proof of immunity). For pregnant women who cannot receive VZIG within 96 hours of exposure, clinicians may choose either to administer IGIV or to closely monitor the women for signs and symptoms of varicella and institute treatment with acyclovir if illness occurs.

* **Antiviral prophylaxis:** Another method indicated by some experts for postexposure prophylaxis of chickenpox is acyclovir. Limited data on acyclovir as postexposure prophylaxis are available for healthy children only. Studies were not done for adults. Limited clinical experience also supports use of acyclovir as postexposure prophylaxis, and clinicians may choose this option, with or without other methods. If acyclovir is used as postexposure prophylaxis, the recommendation is for administration beginning from days 7–10 after exposure, for a total of 7 days of therapy. The recommended dose is 40–80 mg/kg/day, divided into 4 doses for children, and 800 mg, 4 times/day for adults. If illness occurs, antiviral therapy should be instituted at the earliest signs or symptoms. If the patient did not develop disease, varicella vaccine should be administered at a later date, if it is not contraindicated.

Guidelines on VZIG or IGIV prophylaxis:

- a. VZIG: The recommended dosage of VZIG is 125U/10 kg body weight (maximum of 625 units [5 vials]) given intramuscularly within 96 hours of exposure. Depending on the volume required, it may need to be given in divided doses. The minimum dose is 125U. Please refer to the package insert for more information. Investigational VariZIG™ is supplied in 125-U vials.
IGIV: The currently recommended dosage for IGIV is 400 mg/kg administered once and as soon as possible, within 96 hours of exposure.
 - b. If an individual has received VZIG or IGIV <4 days (96 hours) after exposure (or ≥ 400 mg IGIV, ≤ 3 weeks before exposure), no additional immunoprophylaxis is necessary.
 - c. Any patient who receives VZIG or IGIV should be observed for 28 days following exposure (because these agents may prolong the incubation period by >1 week).
 - d. Antiviral therapy should be instituted immediately if signs and symptoms of chickenpox occur, regardless of receipt of VZIG or IGIV. The route and duration of therapy should be determined by specific host factors, by the extent of infection, and by initial response to therapy.
 - e. Patients who receive VZIG or IGIV should be vaccinated (after the appropriate interval), provided they do not have contraindications to varicella vaccine.
 - f. Varicella and MMR vaccines must be deferred for ≥ 5 months after receipt of VZIG. Please refer to *Attachment C: Suggested Intervals between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines* (found at the end of this chapter) for more information.
 - g. Varicella and MMR vaccines must be deferred for >8 months after receipt of IGIV.
7. Recommend the exclusion of high-risk susceptible contacts from a setting until 1 incubation period (21 days) after their last exposure (to protect them from further exposure), or if they receive VZIG or IGIV, 28 days after their last exposure (to protect others should they develop infection). After this time, they may return if no additional cases have been identified. If a health care setting is involved, see Section 4C for more information.
 8. Immunize all other susceptibles. Recommend varicella vaccine to eligible, susceptible, exposed individuals in institutional settings (e.g., childcare centers, schools, health care settings). See *Attachment B: Special*

Considerations in the Administration of Varicella Vaccine (found at end of this chapter) for information about some groups who should not receive varicella vaccine.

Varicella vaccination ≤ 3 days after exposure to an individual with chickenpox is approximately 90% effective in preventing disease, and vaccination ≤ 5 days is approximately 70% effective in preventing disease and even more effective in modifying disease.* Please note the following:

- a. In most non-health care settings, including schools, vaccination within five days is acceptable; however, there may be some situations when more stringent measures may be recommended by MDPH.
 - b. Long-term care facilities, depending on their population (e.g., lower risk situation of relatively healthy, U.S.-born individuals), may choose vaccination within five days after exposure. Those with high-risk patients, (e.g., many patients with underlying medical problems, including those who require mechanical ventilation, have immunosuppression, or have neurologic compromise) may choose vaccination within three days after exposure.
 - c. For those groups to which the reportable diseases isolation and quarantine requirements apply (see Section 4A), vaccination must be given within the recommended time period, or exclusion may still be necessary.
 - d. Vaccinating someone who is incubating chickenpox or is immune to chickenpox is not harmful.
 - e. If vaccine is given at any time following exposure, parents and others should be informed that chickenpox could occur in spite of vaccination.
 - f. If chickenpox develops in susceptible individuals, with or without postexposure vaccination, antiviral treatment (e.g., acyclovir) is recommended for adolescents, adults, and secondary case patients who are household contacts of infected children.
9. Exclude/quarantine all other exposed susceptible contacts who have not been immunized, if required. The following four groups must be quarantined or isolated if exposed:
- a. Susceptible students or staff who are not appropriately immunized, are without laboratory evidence of immunity, or do not have a reliable history of chickenpox:
 - i. If there was a discrete (one time) exposure, exclude susceptibles on days 10–21 from exposure to someone who was infectious with a chickenpox rash (not including the prodrome).
 - ii. If there was more than one discrete exposure (e.g., attended school on days 2, 3, and 4 after rash onset in the person with chickenpox), exclude susceptibles on days 10–21 from the earliest exposure to someone who was infectious with a chickenpox rash.
 - iii. If there was continuous exposure (as might occur in a household), exclude on days 10–21 from the date of rash onset in the case.

Additional information regarding exclusion: If contacts are vaccinated ≤ 5 days after exposure to a person with a rash, they may return to school or work immediately, and there is no exclusion.

- ◆ An exception is the high-risk setting (e.g., when immuno-compromised people or susceptible pregnant women may be exposed, in institutional/residential settings with large numbers of non-U.S. born individuals, or in health care settings; see Section 4B for more information), where vaccination must occur ≤ 3 days after exposure for the person to return.

* Source: Personal communication with CDC.

- ◆ In some very high-risk situations, all susceptibles may need to be excluded, regardless of timing of vaccination post-exposure.

Consultation with the MDPH can help determine the best course of action for a high-risk setting.

Note: Although only 1 dose of varicella vaccine is needed post-exposure to allow return to school or work, individuals ≥ 13 years of age should routinely receive a 2nd dose 28 days after the 1st (unless serological testing was done, demonstrating immunity).

- ◆ Parents of children with valid medical or religious exemptions should confirm that these children are susceptible (a child may have a history of chickenpox or laboratory evidence of immunity, despite having a religious exemption on file). If these children are susceptible and will not be vaccinated within the appropriate time frame after exposure, they are to be excluded, as indicated above.
- b. Neonates born to mothers with active chickenpox shall be isolated from susceptibles until 21 days of age.
 - c. Health care workers, including school nurses, should be managed as described in Section 4C.
 - d. Anyone receiving VZIG or IGIV shall extend his/her exclusion to 28 days post-exposure because VZIG and IGIV may prolong the incubation period of chickenpox.
10. Supply potentially exposed individuals with information. In institutional settings, including childcare centers and schools, provide potentially exposed attendees (or their parents) and staff with: 1) written or verbal notice of the case or outbreak (without personal identifiers); 2) the MDPH *Chickenpox Fact Sheet* (see Section 4D for information on where to obtain a copy); 3) a letter encouraging and authorizing providers to use state-supplied varicella vaccine for eligible, susceptible, exposed individuals; and 4) the *Varicella Vaccine Information Statement* (VIS), available on the MDPH website at www.mass.gov/dph/cdc/epii/imm/imm.htm#vis. Review the importance of careful hand washing with staff and students, especially after touching discharges from nose, throat, or chickenpox lesions, and the importance of not sharing eating utensils or toys that are put into the mouth.
 11. Conduct surveillance for chickenpox for 21 days (1 incubation period) after the last exposure to chickenpox. For those who received VZIG or IGIV and where immunocompromised individuals are involved, surveillance should continue for 28 days.

C. Managing Special Situations

Health Care Settings (Including Acute and Long-term Care Facilities)

1. All health care workers should ensure that they are immune to chickenpox. Immunization at time of employment is recommended for all health care workers and is particularly important for susceptible health care workers who have close contact with persons at high-risk for serious complications, including: a) premature infants born to susceptible mothers; b) premature infants who are born at <28 weeks of gestation or who weigh $\leq 1,000$ g at birth (regardless of maternal immune status); c) pregnant women; and d) immuno-compromised individuals. Healthy adolescents and adults are also at higher risk for complications, and healthy, full-term newborns born to susceptible mothers may be as well.
2. In health care institutions, serologic screening of personnel who have a negative or uncertain history of chickenpox is likely to be reliable and cost-effective. Routine testing for chickenpox immunity after 2 doses of vaccine is not necessary because 99% of adults are seropositive after the 2nd dose. Seroconversion, however, does not always result in full protection against disease. For vaccinated health care workers who are subsequently

exposed to chickenpox (or shingles), the following measures should be considered (depending upon the setting):

- a. Test for serologic immunity immediately after chickenpox exposure. LA can be done quickly and may be a useful post-exposure test. However, recent evidence has shown that false positives can occur, incorrectly categorizing a susceptible person as immune. Therefore, less sensitive EIAs are recommended for screening purposes when possible.
 - b. Retest 5–6 days after exposure to determine if an anamnestic response (boosting of antibody titers) is present.
 - c. Those workers who remain susceptible should be excluded.
 - d. Alternatively, consider exclusion or reassignment of personnel who do not have detectable antibody (particularly if their duties involve care for high-risk patients).
3. Isolate/exclude the case, if vesicles are present, until all lesions have crusted over, usually by the fifth day after rash onset but sometimes longer in immuno-compromised individuals. If no vesicles are present, the case should be isolated/excluded until the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later. Inpatients with chickenpox should be placed on contact and airborne isolation (negative pressure room).
 4. Identify all those exposed. “Exposure” to chickenpox is defined as contact with nasopharyngeal secretions or lesions, face-to-face interaction, or sharing indoor airspace with an infectious person (e.g., occupying the same 2–4-bed ward or adjacent beds in a large ward).
 5. Identify susceptibles among the exposed. Susceptibles are those without proof of immunity as defined below:

Proof of Immunity to Varicella¹

- ◆ Documentation of age-appropriate, prior vaccination against chickenpox (1 dose at 1–12 years of age or 2 doses, ≥ 1 month apart, at ≥ 13 years of age);
- ◆ Born in the U.S. before 1966 (regardless of history of chickenpox);
- ◆ Born outside the U.S. before 1966 with a reliable history of chickenpox (a recollection or record of past disease from the person, parent, or physician is sufficient^{2,3});
- ◆ Born in or after 1966 (regardless of country of birth) with a reliable history of chickenpox (as described above);
- ◆ A reliable history of shingles based on health care provider diagnosis; or
- ◆ Serologic proof of immunity⁴.

¹ Bone marrow transplant recipients should be considered susceptible, regardless of history of past disease.

² A self-report of typical disease is sufficient for college students as well as for staff in all settings. The exception is in school settings, where a physician-certified history of disease is required for students in childcare, preschool, or grades K–12.

³ For those with a history of an atypical, mild case, seek an epidemiological link to a typical chickenpox case (e.g., case is/was in the context of an outbreak or there was a case in the household or classroom within three weeks of illness) or laboratory confirmation at time of acute illness. If such documentation is lacking, persons should not be considered as having a valid history of disease because other diseases may mimic mild atypical chickenpox.

⁴ Or, laboratory-confirmed at time of acute illness.

Guidance for Interpreting a Past History of Chickenpox

- ◆ In the pre-vaccine era (before 1995), the rash of chickenpox was distinct and subclinical cases were rare.
- ◆ Since chickenpox has been endemic in the U.S, epidemiologic and serologic studies indicate that >95% of U.S.-born adults are immune to chickenpox, and adults with a negative or uncertain history are actually 71–93% likely to have VZV antibodies when tested. Individuals born in the U.S. before 1966 are considered immune.
- ◆ In foreign-born adult populations, particularly those from tropical countries, the proportion immune to chickenpox is likely to be much lower as chickenpox may be less common in those countries. Therefore, those born outside the U.S. before 1966 should be considered immune only if they have a reliable history of disease.
- ◆ History of disease is likely to vary in different populations, and every effort should be made to obtain accurate histories of disease. These efforts should include the use of interpreters, as available, and verification of history with family members.
- ◆ For those individuals reporting atypical or mild cases of chickenpox, it is important to help establish the likelihood of disease by asking if household members or other close contacts (e.g., contacts in childcare, school, or other outbreak settings) had chickenpox within three weeks of the individual's illness (or if there was laboratory confirmation at the time of acute illness). If such documentation is lacking, persons should not be considered as having a valid history of disease because other diseases may mimic mild atypical chickenpox.
- ◆ As we move forward in the post-vaccine era in the U.S., chickenpox will become less common and its clinical presentation less distinctive. For persons born in or after 1998, a history of chickenpox will become less reliable. If there is any question about the 'reliability' of the past history of chickenpox, the individual should be considered susceptible, unless serologic proof of immunity is obtained.
- ◆ Serologic testing for immunity is an option for individuals with a negative or uncertain history.

In most outpatient and many inpatient health care settings, a reliable history of chickenpox or shingles may be acceptable proof of immunity. However, in those health care settings that care for high-risk and immunosuppressed patients (e.g., neonatal ICU, oncology unit, transplant unit), infection control personnel may not feel those individuals born in the U.S. before 1966 or those reporting past history of disease have acceptable evidence of immunity.

For information on screening for immunity, refer to Section 2B.

6. Identify high-risk susceptible patients/staff among the exposed. Refer to Section 4B for information about exposed high-risk susceptible groups and use of VZIG (or IGIV if VZIG is not available) and/or acyclovir. High-risk susceptible patients/staff exposed to a case of chickenpox or shingles should receive VZIG or IGIV as soon as possible, within 96 hours of exposure.
7. Immunize all other susceptibles. Recommend varicella vaccine to eligible, susceptible, exposed patients/staff. See *Attachment B: Special Considerations in the Administration of Varicella Vaccine* for information about some groups who should not receive varicella vaccine.

In most health care settings, there are more rigorous criteria regarding post-exposure vaccination, and varicella vaccine must be given ≤ 3 days after exposure to an individual with rash. However, in long-term care settings,

where most residents are older and U.S.-born, vaccination within five days of exposure to someone with a rash is acceptable.

Vaccinating someone who is incubating chickenpox or is immune to chickenpox is not harmful. If vaccine is given following exposure, recipients should be informed that chickenpox could occur in spite of vaccination.

If chickenpox develops in susceptible individuals, with or without postexposure vaccination, antiviral treatment (e.g., acyclovir) is recommended for adolescents, adults, and secondary case patients who are household contacts of infected children.

8. Discharge or isolate exposed susceptible patients. Discharge all exposed, susceptible patients as soon as possible. Isolate on contact and airborne precautions, all such patients who cannot be discharged from days 10–21 after first exposure to someone who was infectious (including the prodrome). Those who have received VZIG or IGIV must remain in isolation until day 28. Newborns born to mothers with active chickenpox should be isolated from susceptibles until 21 days of age, if they do not receive VZIG or IGIV, or until 28 days of age if they do.
9. Exclude exposed susceptible health care personnel. Susceptible health care workers shall be excluded from their occupations from the 10th day after their first exposure during the case's infectious period (including the prodrome) through the 21st day after the last exposure to the infectious case. In most health care settings, health care personnel will not need to be excluded if they have been vaccinated ≤ 3 days of exposure to the rash. The exception may be long-term care facilities (see Section 4C, #7, for more information).
 - a. In some very high-risk settings, infection control practitioners may wish to exclude or reassign all susceptibles, regardless of timing of vaccination post-exposure. Decisions about exclusion will depend on such factors as the setting (e.g., neonatal ICU, oncology unit, transplant unit) and the degree of direct patient contact.
 - b. Anyone receiving VZIG or IGIV shall extend his/her exclusion to 28 days post-exposure.
10. Consider testing exposed immunized staff. While this is not routinely recommended, it may be necessary in health care settings. Since seroconversion does not always result in complete protection against disease, testing vaccine recipients for seropositivity immediately after exposure and retesting 5–6 days later for an anamnestic response is a potentially effective strategy for identifying those who remain at risk for chickenpox (e.g., those who are seronegative for both tests). While this strategy is not practical in all settings, it may be used in high-risk areas.
11. Conduct surveillance for chickenpox for 21 days (1 incubation period) after the last exposure to chickenpox. For those who received VZIG or IGIV and where immuno-compromised individuals are involved, surveillance should continue for 28 days.
12. Management of health care workers with rash post varicella vaccine: If vaccine-associated rash occurs in a health care worker, every effort should be made to determine if the rash is due to vaccine virus or wild-type VZV. Persons should be managed as wild-type varicella if testing is not done and while awaiting results of testing.

Institutional Settings Where Group A Streptococcal (GAS) Infection is Also Present

Invasive GAS infection as a complication following chickenpox is becoming more common. The MDPH has detailed control measures for childcare centers and schools where chickenpox is accompanied by GAS infection, whether invasive or non-invasive. The central strategy involves rapid vaccination of exposed susceptibles and antibiotic

treatment where indicated. In non-health care settings, varicella vaccine should be given within five days after exposure, while in high-risk settings (including health care settings) vaccine should be given within three days. Contact the MDPH Division of Epidemiology and Immunization immediately for assistance at (617) 983-6800 or (888) 658-2850. Also refer to the *Group A Streptococcus (Invasive)* chapter in this manual for more information about this infection.



Section 5:

CONTROLLING FURTHER SPREAD: CHICKENPOX SPREAD FROM SHINGLES

A. Isolation and Quarantine Requirements (*150 CMR 300.200*)

There are no isolation or quarantine requirements for shingles cases. However, susceptible contacts of shingles cases with pertinent exposures, as defined in Section 5B, should be excluded for the same time periods as susceptible contacts of chickenpox cases.

B. Protection of Contacts of a Case of Shingles

Lesions in individuals with shingles carry the virus that causes chickenpox. Therefore, persons with shingles must be very careful about personal hygiene and must wash their hands if they touch their lesions. In otherwise healthy individuals, lesions that are covered appear to pose little risk to susceptible individuals. Unless the shingles rash can be completely covered, it is advisable that individuals with shingles stay at home until the rash is crusted over and dry. Children with shingles whose lesions cannot be covered should be excluded from childcare/school until their lesions have crusted.

In a high-risk setting, if there is doubt about a case's ability to comply with keeping lesions covered (e.g., young children, individuals with developmental delay), the case may be asked to stay home until he/she is no longer infectious. Additionally, those with shingles should avoid contact with those at higher risk for infection with VZV. This is not possible in some settings, and in these situations, exclusion of the case (or the high-risk individual[s]) may be considered.

Those who have disseminated shingles, or are immuno-compromised with either localized or disseminated shingles, can transmit VZV via the airborne route and should stay home, or if in the hospital, should be placed on airborne isolation for the duration of the illness.

“Exposure” to uncomplicated shingles is defined as contact with lesions, (e.g., through close patient care, touching, or hugging). “Exposure” to disseminated shingles (or localized or disseminated shingles in an immuno-compromised person) is defined as: 1) contact with lesions (e.g., through close patient care, touching, or hugging); or 2) sharing indoor airspace (e.g., occupying the same 2–4-bed ward or adjacent beds in a large ward).

Control measures are the same as for chickenpox in Section 4B and include vaccination of susceptible contacts.

C. Managing Special Situations

Health Care Settings, Including Acute and Long-term Care Facilities

1. All health care workers should ensure that they are immune to chickenpox. Immunization is particularly important for susceptible health care workers who have close contact with persons at high risk for serious complications, including: a) premature infants born to susceptible mothers; b) premature infants who are born at <28 weeks of gestation or who weigh $\leq 1,000$ g at birth (regardless of maternal immune status); c) pregnant women; and d) immuno-compromised individuals. Healthy adolescents and adults are also at higher risk for complications, and healthy, full-term newborns born to susceptible mothers may be at higher risk for complications as well.
2. In health care facilities, serologic screening before vaccination of personnel who have a negative or uncertain history of chickenpox is likely to be reliable and cost effective. Routine testing for chickenpox immunity after 2 doses of vaccine is not necessary because 99% of adults are seropositive after the 2nd dose. Seroconversion, however, does not always result in full protection against disease. For vaccinated health care workers who are subsequently exposed to shingles or chickenpox, the following measures should be considered:
 - a. Test for serologic immunity immediately after chickenpox exposure. LA can be done quickly and may be a useful post-exposure test. However, recent evidence has shown that false positives can occur, incorrectly categorizing a susceptible person as immune. Therefore, less sensitive EIAs are recommended for screening purposes when possible, as fewer false positives occur.
 - b. Retest 5–6 days later to determine if an anamnestic response (boosting of antibody titers) is present.
 - c. Those workers who remain susceptible should be excluded. Alternately, consider exclusion or reassignment of personnel who do not have detectable antibody (particularly if their duties involve care for high-risk patients).
3. Prevent exposure, as follows:

Staff

 - a. Staff with localized shingles should cover lesions with a taped dressing and should be removed from direct care of patients at high risk until their skin lesions have become dry and crusted.
 - b. Staff with disseminated shingles and immuno-compromised staff with shingles should be excluded from work for the duration of their illness.

Patients

 - a. Patients with localized shingles should be cared for using standard precautions (including, but not limited to, hand washing, gloves, masks, eye protection during activities likely to generate splashes, and nonsterile gowns) until all lesions are crusted. Current or prospective roommates should be immune or should get vaccinated.
 - b. Patients with disseminated shingles and immuno-compromised patients with shingles (either localized or disseminated) require airborne isolation (including negative pressure room) and contact precautions for the duration of the illness.
4. Identify all those exposed.
 - a. “Exposure” to uncomplicated shingles is defined as contact with lesions (e.g., through close patient care, touching, or hugging).

- b. “Exposure” to disseminated shingles (or localized or disseminated shingles in an immuno-compromised person) is defined as: 1) contact with lesions (e.g., through close patient care, touching, or hugging); or 2) sharing indoor airspace with the infectious person (e.g., occupying the same 2–4-bed ward or adjacent beds in a large ward).
5. Identify susceptibles among the exposed. Susceptibles are those without proof of immunity as defined below.

Proof of Immunity to Varicella¹

- ◆ Documentation of age-appropriate, prior vaccination against chickenpox (1 dose at 1–12 years of age or 2 doses, ≥ 1 month apart, at ≥ 13 years of age);
- ◆ Born in the U.S. before 1966 (regardless of history of chickenpox);
- ◆ Born outside the U.S. before 1966 with a reliable history of chickenpox (a recollection or record of past disease from the person, parent, or physician is sufficient^{2,3});
- ◆ Born in or after 1966 (regardless of country of birth) with a reliable history of chickenpox (as described above);
- ◆ A reliable history of shingles based on health care provider diagnosis; or
- ◆ Serologic proof of immunity⁴.

¹ Bone marrow transplant recipients should be considered susceptible, regardless of history of past disease.

² A self-report of typical disease is sufficient for college students as well as for staff in all settings. The exception is in school settings, where a physician-certified history of disease is required for students in childcare, preschool, or grades K–12.

³ For those with a history of a mild atypical case, seek an epidemiological link to a typical chickenpox case (e.g., case is/was in the context of an outbreak or there was a case in the household or classroom within three weeks of illness) or laboratory confirmation at time of acute illness. If such documentation is lacking, persons should not be considered as having a valid history of disease because other diseases may mimic mild atypical chickenpox.

⁴ Or, laboratory-confirmed at time of acute illness.

Guidance for Interpreting a Past History of Chickenpox

- ◆ In the pre-vaccine era (before 1995), the rash for chickenpox was distinct and subclinical cases were rare.
- ◆ Since chickenpox has been endemic in the U.S., epidemiologic and serologic studies indicate that >95% of U.S.-born adults are immune to chickenpox, and adults with a negative or uncertain history are actually 71–93% likely to have VZV antibodies when tested. Those individuals born in the U.S. before 1966 are considered immune.
- ◆ In foreign-born adult populations, particularly those from tropical countries, the proportion immune to chickenpox is likely to be much lower as chickenpox may be less common in those countries. Therefore, those born outside the U.S. before 1966 should be considered immune only if they have a reliable history of disease.
- ◆ History of disease is likely to vary in different populations, and every effort should be made to obtain accurate history of disease. These efforts should include the use of interpreters, as available, and verification of history with family members.
- ◆ For those individuals reporting atypical or mild cases of chickenpox, it is important to help establish the likelihood of disease by asking if household members or other close contacts (e.g., contacts in childcare,

school, or other outbreak settings) had chickenpox within three weeks of the individual's illness (or if there was laboratory confirmation at time of acute illness). If such documentation is lacking, persons should not be considered as having a valid history of disease because other diseases may mimic mild atypical chickenpox.

- ◆ As we move forward in the post-vaccine era in the U.S., chickenpox will become less common and its clinical presentation less distinctive. For persons born in or after 1998, a history of chickenpox will become less reliable. If there is any question about the 'reliability' of the past history of chickenpox, the individual should be considered susceptible, unless serologic proof of immunity is obtained.
- ◆ Serologic testing for immunity is an option for individuals with a negative or uncertain history.

For information on screening for immunity, refer to Section 2B.

6. Identify high-risk susceptible patients/staff among the exposed. Refer to Section 5B for information about exposed high-risk susceptible groups and use of VZIG (or IGIV if VZIG is not available) and/or acyclovir. High-risk susceptible patients/staff exposed to a case of chickenpox or shingles should receive VZIG or IGIV as soon as possible, within 96 hours of exposure.
7. Immunize all other susceptibles. Recommend varicella vaccine to eligible, susceptible, exposed patients/staff. See *Attachment B: Special Considerations in the Administration of Varicella Vaccine* for information about some groups that should not receive varicella vaccine. Varicella vaccine can prevent or modify disease if given within 3–5 days after exposure. Vaccinating someone who is incubating chickenpox or is immune to chickenpox is not harmful. If vaccine is given following exposure, recipients should be informed that chickenpox could occur in spite of vaccination.
 - a. In health care settings, vaccination should occur within three days of exposure to someone with a rash.
 - b. Some long-term care facilities, depending on their population (e.g., lower risk situation of relatively healthy, U.S.-born individuals), may choose vaccination within five days after exposure. Those with high-risk patients, (e.g., many patients with underlying medical problems, including those that require mechanical ventilation, have immunosuppression, or have neurologic compromise) may choose vaccination within three days after exposure.
 - c. If chickenpox develops in susceptible individuals, with or without post-exposure vaccination, antiviral treatment (e.g., acyclovir) is recommended for adolescents, adults, and secondary case patients who are household contacts of infected children.
8. Discharge or isolate exposed susceptible patients. Discharge all exposed, susceptible patients as soon as possible. Isolate on contact precautions and airborne isolation all such patients who cannot be discharged from days 10–21 after 1st exposure to someone who was infectious (including the prodrome). Those who have received VZIG or IGIV must remain in isolation until day 28. Newborns born to mothers with active chickenpox should be isolated from susceptibles until 21 days of age, if they do not receive VZIG or IGIV, or until 28 days of age if they do.

Exclude exposed susceptible health care personnel. Susceptible health care workers shall be excluded from their occupations from the 10th day after their first exposure during the case's infectious period (including the prodrome) through the 21st day after the last exposure to the infectious case. In most health care settings, health care personnel will not need to be excluded if they have been vaccinated ≤ 3 days of exposure to the rash. In some very high-risk settings, all susceptibles may need to be excluded regardless of timing of vaccination post-exposure, and decisions about exclusion will depend on such factors as the setting (e.g., neonatal unit vs. long-term care facility for elderly) and the degree of direct patient contact.

Some long-term care facilities, depending on their populations (e.g., lower risk situation of relatively healthy, U.S.-born individuals), may choose vaccination within five days after exposure. Those with high-risk patients (e.g., many patients with underlying medical problems, including those that require mechanical ventilation, have immunosuppression, or have neurologic compromise) may choose vaccination within three days after exposure. Anyone receiving VZIG or IGIV shall have his/her exclusion extended to 28 days post-exposure.

9. Consider testing exposed immunized staff. Since seroconversion does not always result in complete protection against disease, testing vaccine recipients for seropositivity immediately after exposure and retesting 5–6 days later for an anamnestic response is a potentially effective strategy for identifying those who remain at risk for chickenpox (e.g., those who are seronegative for both tests). While this strategy is not practical in all settings, it may be used in high-risk areas.
10. Conduct surveillance for chickenpox for 21 days (1 incubation period) after the last exposure to chickenpox. For those who received VZIG or IGIV, and where immuno-compromised individuals are involved, surveillance should continue for 28 days.

D. Preventive Measures

Vaccination, including routine childhood vaccination, catch-up vaccination of adolescents, and targeted vaccination of high-risk adult groups, is the best preventive measure against chickenpox and subsequent shingles. Good personal hygiene (which consists of proper hand washing, disposal of used tissues, not sharing eating utensils, etc.) is also important. Please refer to the most current versions of the ACIP statements on varicella (listed under *References* section), MDPH's *Immunization Guidelines*, and MDPH's *Massachusetts Immunization Program-State Supplied Vaccines and Patient Eligibility Criteria* for details about varicella vaccine, the recommended schedule, who should and shouldn't get the vaccine, and who is eligible to receive state-supplied vaccine. These, as well as other relevant resources, are available through the MDPH Division of Epidemiology and Immunization at (617) 983-6800 or (888) 658-2580.

A Chickenpox (Varicella) Public Health Fact Sheet for the general public is available from the MDPH Division of Epidemiology and Immunization or on the MDPH website at www.mass.gov/dph. Click on the "Publications and Statistics" link, and under "Communicable Disease Control," scroll down to the "Public Health Fact Sheets" link.



ADDITIONAL INFORMATION

The following is the formal CDC surveillance case definition for chickenpox. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.

Case Definition for Varicella (as defined by CSTE, 1999)

An illness with acute onset of diffuse (generalized) maculopapulovesicular rash, without other apparent cause. In vaccinated persons who develop chickenpox more than 42 days after vaccination (breakthrough disease), the disease is almost always mild with <50 skin lesions and shorter duration of illness. The rash may also be atypical in appearance (maculopapular, with few or no vesicles).

Laboratory Criteria for Diagnosis

- ◆ Positive serologic test for varicella-zoster immunoglobulin M (IgM) antibody;
- ◆ Isolation of VZV, demonstration of VZV antigen by direct fluorescent antibody (DFA) or by polymerase chain reaction (PCR) tests from a clinical specimen; or
- ◆ Significant rise in serum varicella immunoglobulin G (IgG) antibody level by any standard serological assay.

Case Classification

Probable	A case that meets the clinical case definition, is not laboratory-confirmed, and is not epidemiologically-linked to another probable or confirmed case.
Confirmed	A case that is laboratory-confirmed or that meets the clinical case definition and is epidemiologically-linked to a confirmed or probable case.

Comments

- ◆ Two probable cases that are epidemiologically-linked would be considered confirmed, even in the absence of laboratory confirmation.
- ◆ In vaccinated persons who develop chickenpox more than 42 days after vaccination (breakthrough disease), the disease is almost always mild with <50 skin lesions and shorter duration of illness. The rash may also be atypical in appearance (maculopapular, with few or no vesicles).
- ◆ Laboratory confirmation of cases of chickenpox is not routinely recommended. Laboratory confirmation is recommended for fatal cases and in other special circumstances.



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ATTACHMENTS

Attachment A: Guidelines for Evaluating Chickenpox-Like Rash in Recipients of Varicella Vaccine in Childcare and School Settings

Attachment B: Special Considerations in the Administration of Varicella Vaccine

Attachment C: Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines

Attachment A

Guidelines for Evaluating Chickenpox-like Rash in Recipients of Varicella Vaccine in Childcare and School Settings

The three most important features to evaluate are: 1) the severity of the chickenpox-like illness; 2) any known exposure to chickenpox; and 3) the time interval since receipt of varicella vaccine, as outlined below.

Symptoms	<ul style="list-style-type: none"> ◆ Generalized rash (typically 200 – >500 lesions with many vesicles) ◆ Fever ◆ Cough (If “partial” immunity has developed, symptoms may be attenuated)	<ul style="list-style-type: none"> ◆ Generalized rash, more maculo-papular than vesicular (usually <50 lesions) ◆ Often afebrile ◆ Minimally symptomatic 	<ul style="list-style-type: none"> ◆ Generalized rash, more maculopapular than vesicular (<20 lesions [median=5]) ◆ Some localized vesicles at the site of injection (median=2) ◆ Afebrile ◆ Asymptomatic
<i>and</i>			
Exposure to Chickenpox	Often a known or possible exposure	Often a known or possible exposure	No known exposure
<i>and</i>			
Timing Post Vaccination	Rash occurs <7 days or >42 days (but can also occur between 7–42 days)*	Rash usually occurs >42 days (but can also occur between 7–42 days)*	Rash occurs at 7–21 days (but can occur up to 42 days)*
↓			
Type of Disease	Wild-type chickenpox (either vaccine has not yet induced protective immunity or vaccine failed)	Vaccine-modified varicella syndrome (VMVS) or “break-through chickenpox” (occurs in 20–27% of vaccinated children and adults, respectively, with household exposure to wild-type varicella)	Likely to be side effect of vaccine (occurs in 4% of vaccinees)
↓			
Infectious	Highly infectious	Infectious	<ul style="list-style-type: none"> ◆ Much less infectious than non-vaccine modified wild-type disease ◆ If transmission occurs, infection may be asymptomatic or attenuated
↓			
Exclude	Exclude from school until all lesions have dried and crusted over, or until no new lesions appear, usually by the 5 th day after rash onset	If vesicles present, exclude as for wild-type chickenpox. If no vesicles present, until lesions have faded (i.e., the lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24 hour period, whichever is later	If no high-risk susceptible contacts are identified and local policy permits, the child may attend school

* Rashes occurring days 7–42 post vaccination may be due to either wild-type or vaccine-type virus. PCR may be used to differentiate.

Distinguishing rash induced by varicella vaccine virus from rash caused by wild-type virus in a vaccine recipient is critical in making appropriate community infection control decisions and patient management decisions, particularly regarding individuals at risk for serious complications of varicella. The three most important features to consider in making these determinations are: 1) the severity of the chickenpox-like illness; 2) any known exposure to chickenpox; and 3) the time interval since receipt of varicella vaccine. The MDPH is providing the guidance outlined below to assist in making this determination.

There are three possible categories of chickenpox-like rash in vaccine recipients:

1. Wild-type chickenpox (can occur at any time post-vaccination, but rashes occurring <7 and >42 days should be considered wild-type):
 - a. <7 days post-vaccination: In this case, exposure to wild-type virus happens prior to or immediately following vaccination. Wild-type chickenpox can occur in this scenario due to insufficient time for immunity to develop prior to exposure.
 - b. 7–42 days post-vaccination: In this case, it is difficult to determine if the rash is due to wild-type or vaccine-type virus. PCR testing is available to make this determination. However, if the rash does not appear to be a “side effect” of the vaccine (as described in #3 below), it should be considered wild-type with regard to infectiousness, and susceptible contacts should be excluded as indicated.
 - c. >42 days post-vaccination: In this case, the vaccine recipient has not responded sufficiently to the vaccine prior to exposure. The lack of vaccine-induced protection may also reflect insufficient time post-vaccination for immunity to develop, or it may be due to host- or vaccine-specific issues impairing response to vaccine (“vaccine failure”). In these instances, the illness usually presents as typical chickenpox, with a generalized rash with 200 to >500 lesions with many vesicles, fever, and cough. There is often a known or possible exposure to chickenpox. The patient should be considered infectious and should be excluded until the lesions dry and crust over, usually five days after rash onset.
2. Vaccine-modified varicella syndrome (VMVS) or “breakthrough chickenpox:” VMVS is a form of wild-type chickenpox that is less severe due to the development of “partial immunity” that was not sufficient to prevent disease but was able to attenuate symptoms. It usually occurs >42 days post-vaccination but can also occur between 7–42 days. VMVS can occur in up to 20% of vaccinated children and in up to 27% of adults. If the incidence of breakthrough disease is greater than 30% in any particular setting, the Massachusetts Immunization Program (MIP) should be notified for further investigation of the cases, and a vaccine ‘cold chain’ evaluation should be performed. VMVS usually presents as a generalized rash consisting of <50 lesions, usually more maculopapular with a few vesicles. Patients are often afebrile and minimally symptomatic. If vesicles are present, exclusion is the same as for a wild-type case of varicella. If no vesicles are present, exclude until the lesions have faded (i.e., the skin lesions are in the process of resolving; lesions do not need to be completely resolved) or no new lesions appear within a 24-hour period, whichever is later.
3. Vaccine-associated rash (“side effect” from vaccine): This is reported in 4% of vaccine recipients, although in trials, 2% of placebo recipients also developed varicella-like rashes. This rash typically occurs at 7–21 days, but is possible up to 42 days post-vaccination. It usually presents as a generalized rash, more maculopapular than vesicular, consisting of <20 lesions and/or a few vesicles at the site of injection (median=2). If there are more than 20 lesions, the rash is unlikely to be a vaccine-associated rash. Patients are afebrile and otherwise asymptomatic. If the clinical presentation fits these criteria and there is no known exposure to chickenpox, this rash may be related to varicella vaccination. Although there are no official guidelines, this type of rash is caused by attenuated vaccine virus, and for this reason, many experts believe that it is much less infectious than disease caused by wild-type virus. When transmission of vaccine virus has occurred, infection has been found to be mild or asymptomatic. Such patients may be considered NOT infectious if there are no susceptible contacts that are at high-risk for complications of varicella. If local childcare/school policy permits, the vaccinee does NOT need to be excluded. However, they should be advised to avoid close contact with high-risk individuals until the rash has resolved. Childcare and school programs will need to develop their own policies on this issue.

Note: Chickenpox-like rashes occurring during this time period may be caused by wild-type virus, particularly if there is a known or possible exposure to chickenpox or if the rash occurs during chickenpox season. (See Wild-Type above.)

Updated 10/2005

Attachment B

Special Considerations in the Administration of Varicella Vaccine

1. The groups listed below should not receive varicella vaccine except as specified in the vaccine package box. Please consult the package insert for a full list of contraindications and precautions.

- ◆ Infants <12 months of age;
- ◆ Pregnant women (women should avoid getting pregnant until ≥ 1 month after vaccination);
- ◆ Those with anaphylactic reaction to neomycin or other vaccine component (consult package insert);
- ◆ Those on salicylate therapy due to the risk of Reye syndrome (if varicella vaccine has been given, salicylate therapy should be deferred for ≥ 6 weeks);
- ◆ Those with severe illness at the time of the scheduled vaccination (temporary contraindication); and
- ◆ Those with immunocompromising conditions, including malignancies, primary or acquired immunodeficiency, and immunosuppressive therapy, except as noted in box below.

Groups with Potentially Immunocompromising Conditions Eligible to Receive Varicella Vaccine

The following persons with immunocompromising conditions are eligible to be considered for routine varicella immunization. However, varicella vaccine should not be used as post-exposure prophylaxis. If exposed, individuals with immunocompromising conditions should receive VZIG as soon as possible, within 96 hours of exposure.

- ◆ Persons with impaired humoral immunity (e.g., hypogammaglobulinemia, dysgammaglobulinemia).
 - ◆ HIV-infected children who are asymptomatic or mildly symptomatic and aged >12 months with age-specific CD4+ T-lymphocyte percentages of >15%. (If to be vaccinated, these children should receive two doses with a three-month interval between doses and should be monitored for adverse events. These children may have a higher risk of developing a vaccine-associated rash.)
 - ◆ Children with acute lymphoblastic leukemia (ALL) in remission for at least 12 consecutive months and conforming to certain other criteria. (Vaccine available through a research protocol. Health care providers must call [484] 679-2856.)
 - ◆ Persons on non-suppressive topical, aerosol, or local injections of steroids.
 - ◆ Persons receiving systemic steroids and who are not otherwise immunocompromised, if they are receiving <2 mg/kg of body weight or a total of <20 mg/day of prednisone or its equivalent. (Persons on higher-dose steroid therapy cannot receive varicella vaccine—see section on steroids below.)
- ◆ Those having received blood products (except washed red blood cells), plasma, or immune globulin (IG), including VZIG, within the previous 3-11 months (please refer to *Attachment C: Suggested Intervals between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines* for more information). The effect of administration of IG on the antibody response to varicella vaccine is not known. Because of potential inhibition of the response, varicella vaccine should not be administered after receipt of an IG preparation or a blood product (except washed red blood cells), as recommended for measles vaccine. In addition, varicella vaccine should be given ≥ 2 weeks before these blood products. If IG or a blood product is given during this two-week interval, the individual should be reimmunized after the appropriate interval, as

specified in *Attachment C: Suggested Intervals between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines*, or should be tested for varicella immunity at that time and reimmunized if seronegative.

2. Guidelines for administration of live virus vaccines to individuals on steroid therapy:*

Steroid Therapy	Recommendations for Deferral
High dose systemic steroids daily or on alternate days for ≥ 14 days (≥ 2 mg/kg QD or ≥ 20 mg QD of prednisone)	Defer live virus vaccines for ≥ 1 month after treatment has stopped.
High dose systemic steroids daily or on alternate days for < 14 days (≥ 2 mg/kg QD or ≥ 20 mg QD prednisone)	Can give live virus vaccines immediately after treatment is discontinued. However, some experts recommend deferring until ≥ 2 weeks after treatment has stopped, if possible.
Low or moderate doses of systemic steroids given daily or on alternate days (< 2 mg/kg QD or < 20 mg QD of prednisone)	Can give live virus vaccines while on treatment.
Physiologic maintenance doses of steroid (replacement therapy)	Can give live virus vaccines while on treatment.
Topical, aerosol, or local injections of steroids (e.g., skin, aerosol, eyes, intra-articular, bursal, tendon injections)	Can give live virus vaccines on treatment. However, if this therapy is prolonged and there is any clinical or laboratory evidence of immunosuppression, defer for ≥ 1 month after treatment has stopped.
Individuals with a disease which in itself is considered to suppress the immune response and who are receiving systemic or locally acting steroids	Should not give live virus vaccines, except in special circumstances.

* Steroid therapy is not a contraindication for administration of killed vaccines.

Adapted from: CDC. General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP). *MMWR*. 2002; 51(RR-2): 23.

Updated 11/2005

Attachment C

Suggested Intervals Between Administration of Immunoglobulin Preparations and Measles-Containing and Varicella Vaccines

Product/Indication	Dose, Including mg Immunoglobulin G (IgG)/kg Body Weight ¹	Recommended Interval Before Measles or Varicella Vaccination (Months)
Respiratory syncytial virus immune globulin (IG) monoclonal antibody (Synagis™)	15 mg/kg intramuscularly (IM)	None
Tetanus IG	250 units (10 mg IgG/kg) IM	3
Hepatitis A IG		
◆ Contact prophylaxis or international travel <3 months	0.02 mL/kg (3.3 mg IgG/kg) IM	3
◆ International travel 3–5 months	0.06 mL/kg (10 mg IgG/kg) IM	3
Hepatitis B IG	0.06 mL/kg (10 mg IgG/kg) IM	3
Rabies IG	20 IU/kg (22 mg IgG/kg) IM	4
Varicella IG	125 units/10 kg (20–40 mg IgG/kg) IM, maximum 625 units	5
Measles prophylaxis IG		
◆ Standard (i.e., nonimmunocompromised) contact	0.25 mL/kg (40 mg IgG/kg) IM	5
◆ Immunocompromised contact	0.50 mL/kg (80 mg IgG/kg) IM	6
Blood transfusion		
◆ Red blood cells (RBCs), washed	10 mL/kg negligible IgG/kg intravenously (IV)	None
◆ RBCs, adenine-saline added	10 mL/kg (10 mg IgG/kg) IV	3
◆ Packed RBCs (hematocrit 65%)	10 mL/kg (60 mg IgG/kg) IV	6
◆ Whole blood (hematocrit 35–50%)	10 mL/kg (80–100 mg IgG/kg) IV	6
◆ Plasma/platelet products	10 mL/kg (160 mg IgG/kg) IV	7
Cytomegalovirus intravenous immune globulin (IGIV)	150 mg/kg maximum IV	6
Respiratory syncytial virus prophylaxis IGIV	750 mg/kg IV	9
IGIV		
◆ Replacement therapy for immune deficiencies	300–400 mg/kg IV	8
◆ Immune thrombocytopenic purpura	400 mg/kg IV	8
◆ Immune thrombocytopenic purpura	1,000 mg/kg IV	10
◆ Kawasaki disease	2 grams/kg IV	11

1 This table is not intended for determining the correct indications and dosages for using antibody-containing products. Unvaccinated persons might not be fully protected against measles during the entire recommended interval, and additional doses of immune globulin or measles vaccine might be indicated after measles exposure. Concentrations of measles antibody in an immune globulin preparation can vary by manufacturer's lot. Rates of antibody clearance after receipt of an immune globulin preparation might vary also. Recommended intervals are extrapolated from an estimated half-life of 30 days for passively acquired antibody and an observed interference with the immune response to measles vaccine for 5 months after a dose of 80mg IgG/kg. (Source: Mason W., Takahashi M., Schneider T. Persisting Passively Acquired Measles Antibody Following Gamma Globulin Therapy for Kawasaki Disease and Response to Live Vaccination [Abstract 311]. Presented at the 32nd meeting of the Interscience Conference on Antimicrobial Agents and Chemotherapy, Los Angeles, California, October 1992.)

Adapted from: CDC. General Recommendations on Immunization: Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the American Academy of Family Physicians (AAFP). *MMWR*. 2002; 51(RR-2): 7.

Note on other live vaccines: Blood and other antibody-containing products (except washed red blood cells) can also diminish the response to rubella vaccine and potentially to mumps vaccine. Therefore, after immune globulin preparations or other antibody-containing products are received, mumps and rubella vaccines should be deferred for ≥ 3 months. If RSV-IGIV is given, mumps, rubella and varicella vaccines should be deferred for ≥ 9 months. If RSV-IM is given, no deferral is needed for any live virus vaccines.



FORMS & WORKSHEETS

Chickenpox (Varicella) and Shingles (Herpes Zoster)

Chickenpox and Shingles

(Chickenpox is also known as Varicella;
Shingles is also known as Herpes Zoster)



LBOH Action Steps

This form does not need to be submitted to the MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to chickenpox case investigation activities.

LBOH staff should follow these steps when chickenpox is suspected or confirmed in the community. For more detailed information, including disease epidemiology, reporting, case investigation, and follow-up, refer to the preceding chapter.

Reporting

- ☐ Immediately notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report any unusual case(s) or clusters of chickenpox.
- ☐ Deaths should be reported immediately to the MDPH.
- ☐ Uncomplicated, individual cases of chickenpox may be reported on the teleform. Please fax the completed case report form to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS) at (617) 983-6813.
- ☐ There is no case report form for shingles as it is not a reportable disease.

Case Investigation

- ☐ Work with MDPH to obtain the information necessary for completion of the case report form, including clinical information, vaccination history, and laboratory results (if available).

Prevention and Control

- ☐ Work with MDPH to institute isolation and quarantine requirements (*105 CMR 300.200*) and other control measures, as they apply to a particular case.
- ☐ Vaccinate susceptible individuals with varicella vaccine (if not contraindicated) within 3–5 days from exposure, if possible, to prevent exclusion.

Managing Chickenpox in Schools and Other Institutions

In conjunction with MDPH:

- ☐ Determine if there are any high-risk individuals (e.g., infants <1 year of age, immunosuppressed individuals, or pregnant women) or individuals with medical or religious exemptions in exposed group.
- ☐ Implement surveillance for new cases.
- ☐ Notify and educate staff, students, and/or patients.

- ☐ Exclude symptomatic individuals.
- ☐ Exclude/isolate remaining susceptible contacts as indicated. (In most settings, susceptibles may be re-admitted if vaccinated for chickenpox within five days of exposure.)

Managing Chickenpox in Health Care Settings

In addition to actions listed above for schools and other institutions:

- ☐ Notify infection control or employee health of confirmed or suspect case(s) in institution.
- ☐ Ensure all health care personnel have proof of immunity appropriate for health care setting.
- ☐ Vaccinate susceptible health care workers within three days of exposure (in some very high-risk health care settings, may wish to exclude all susceptibles, even if vaccinated post-exposure).
- ☐ Use more rigorous criteria for exclusion/isolation for susceptibles in health care setting, as described in the chapter.